

In re Heung-Jin Joo et al.  
Appl. Serial No. 10/776,394  
Filed February 11, 2004  
Page 2 of 5

### REMARKS

Applicants appreciate the thorough review of the present application as reflected in the Office Action mailed October 5, 2005. Applicants likewise appreciate the allowance of Claims 13-18, 21-25 and 29-31 over the newly cited references, and the indication that Claims 38 and 40-42 are directed to allowable subject matter. Applicants have carefully reviewed the pending rejections of Claims 26-28, 32-37 and 39, and the references cited in support of those rejections. For the reasons discussed below, Applicants respectfully submit that all of the pending claims are patentable over the cited references.

#### I. Claims 26-28 and 32-37 Are Patentable Over the Cited Art

Independent Claim 26 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,339,007 to Wang et al. ("Wang '007") in view of U.S. Patent No. 6,790,676 to Cerva et al. ("Cerva"). (Office Action, pp. 2-3). Claims 27-28 and 32-37, each of which depend from Claim 26, are rejected on the same grounds. Claim 26 recites:

26. A method of forming a ferroelectric memory device comprising:
- forming a lower insulating layer including a contact plug on a semiconductor substrate;
  - forming an upper insulating layer on the lower insulting layer;
  - patterning the upper insulating layer to form an opening exposing the conductive plug;
  - forming an oxygen-diffusion barrier pattern in the opening such that a top surface of the oxygen-diffusion barrier pattern is lower than a top surface of the upper insulating layer;
  - conformally forming a lower electrode layer directly on both an upper surface of the upper insulating layer and an upper surface of the oxygen-diffusion barrier pattern;
  - forming a ferroelectric layer on the lower electrode layer;
  - forming an upper electrode layer on the ferroelectric layer; and then

In re Heung-Jin Joo et al.  
Appl. Serial No. 10/776,394  
Filed February 11, 2004  
Page 3 of 5

patterning the upper electrode layer, the ferroelectric layer and the lower electrode layer.

In the pending rejection, Wang '007 is recited as disclosing each of the recitations of Claim 26 except for the last recitation. (Office Action, p. 3). Applicants respectfully submit, however, that Wang '007 fails to disclose or suggest at least three additional recitations of Claim 26. Accordingly, the rejection of Claim 26, and the rejections of Claims 27-28 and 32-37 which depend therefrom, should be withdrawn.

In particular, Claim 26 recites "patterning the upper insulating layer to form an opening exposing the conductive plug." The Office Action identifies the layer 26 of Fig. 7 of Wang '007 as comprising the "upper insulating layer" of Claim 26. However, as shown with respect to FIGS. 3 and 4 of Wang '007, the upper insulating layer is formed after barrier layer 23, first electrode 24 and hard mask layer 25 are formed on the plug 22. As such, Wang '007 clearly does not disclose or suggest "patterning the upper insulating layer to form an opening exposing the conductive plug." Instead, in Wang '007 the layer 26 is formed around the structures that already exist on plug 22.

Claim 26 further recites "forming an oxygen-diffusion barrier pattern in the opening" in the insulating layer. In contrast, in the method of Wang '007, the barrier layer is formed before the dielectric layer 26 is formed, and certainly is not formed in an opening in an insulating layer.

Claim 26 also recites "conformally forming a lower electrode layer directly on both an upper surface of the upper insulating layer and an upper surface of the oxygen-diffusion barrier pattern." The term "directly on" is defined in the specification of the present application at page 7, lines 9-14 as not allowing for any intervening layers between a first layer that is "directly on" a second layer. The Office Action states that the formation of electrode 28 shown in FIG. 7 of Wang '007 discloses this recitation of Claim 26. However, as is apparent from FIGS. 6 and 7 of Wang '007, the electrode 28 is not formed "directly on . . . an upper surface of the oxygen-diffusion barrier pattern" as recited in Claim 26. Instead, electrode 27 is disposed between electrode 28 and barrier 23. Moreover, electrode 27 is not

In re Heung-Jin Joo et al.  
Appl. Serial No. 10/776,394  
Filed February 11, 2004  
Page 4 of 5

conformally formed on an upper surface of the oxygen-diffusion barrier pattern.

Thus, Applicants respectfully submit that the failure of Wang '007 to teach the above three recitations of Claim 26 provides three independent grounds for withdrawal of the rejection of Claim 26 and the claims depending therefrom.

Applicants also note that the Office Action may be interpreted as suggesting that Claim 26 is directed to patterning the upper electrode layer, the ferroelectric layer and the lower electrode layer in the same step. (*See* Office Action, p. 3). Applicants respectfully submit that this is not what Claim 26 states. Instead, what Claim 26 recites is that the upper electrode layer, the ferroelectric layer and the lower electrode layer are patterned after all three layers have been formed. This patterning may be accomplished, however, through more than one process. Applicants provide this clarification so that there will not be any ambiguity regarding the proper scope and interpretation of Claim 26.

Applicants also respectfully traverse the rejections of dependent Claims 27-28 and 32-37, and submit that these claims are independently patentable over the cited art. However, in light of the reasons, discussed above, that independent Claim 26 is patentable over the cited art, Applicants will not separately address the claims which depend from Claim 26 at this time.

## **II. Claim 39 is Patentable Over the Cited Art**

Independent Claim 39 stands rejected as obvious over Wang '007 in view of U.S. Patent No. 6,933,156 to Wang et al. ("Wang '156") and U.S. Patent No. 6,281,537 to Kim. Wang '007 is cited as disclosing all of the recitations of Claim 39 with the exception of the specific composition of the oxygen diffusion barrier layer set forth in recitation [b] of Claim 39. Wang '007, however, also does not teach or disclose recitation [c] of Claim 39, which states "forming a hard mask layer directly on the oxygen-diffusion barrier layer." Instead, in the device of Wang '007, the hard mask layer 25 is deposited directly on the first electrode layer 24 as opposed to directly on the barrier layer 23. Accordingly, as the cited references

In re Heung-Jin Joo et al.  
Appl. Serial No. 10/776,394  
Filed February 11, 2004  
Page 5 of 5

fail to disclose or suggest all of the recitations of Claim 39, the rejection of Claim 39 should likewise be withdrawn.

### III. CONCLUSION

For the reasons discussed above, Applicants respectfully submit that the present application is in condition for allowance, which action is respectfully requested.

Respectfully submitted,

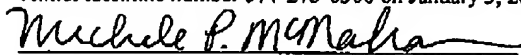


D. Randal Ayers  
Registration No. 40,493

Customer No. 20792  
Myers Bigel Sibley & Sajovec  
P. O. Box 37428  
Raleigh, North Carolina 27627  
Telephone: (919) 854-1400  
Facsimile: (919) 854-1401

#### CERTIFICATION OF FACSIMILE TRANSMISSION UNDER 37 CFR 1.8

I hereby certify that this correspondence is being facsimile transmitted to the Patent and Trademark Office via the central facsimile number 571-273-8300 on January 5, 2006.

  
Michele McMahan